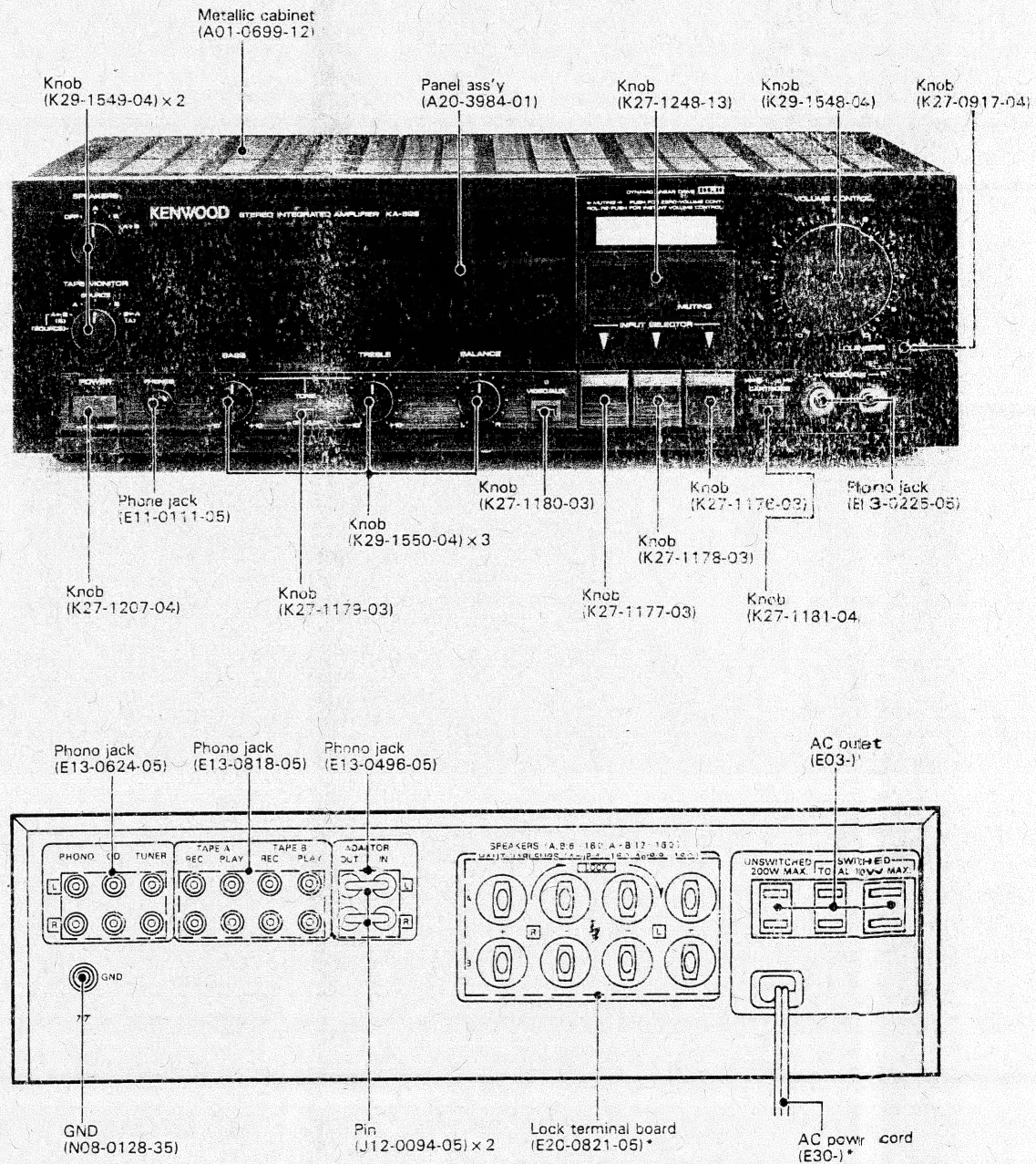


KENWOOD

KA-828

STEREO INTEGRATED AMPLIFIER

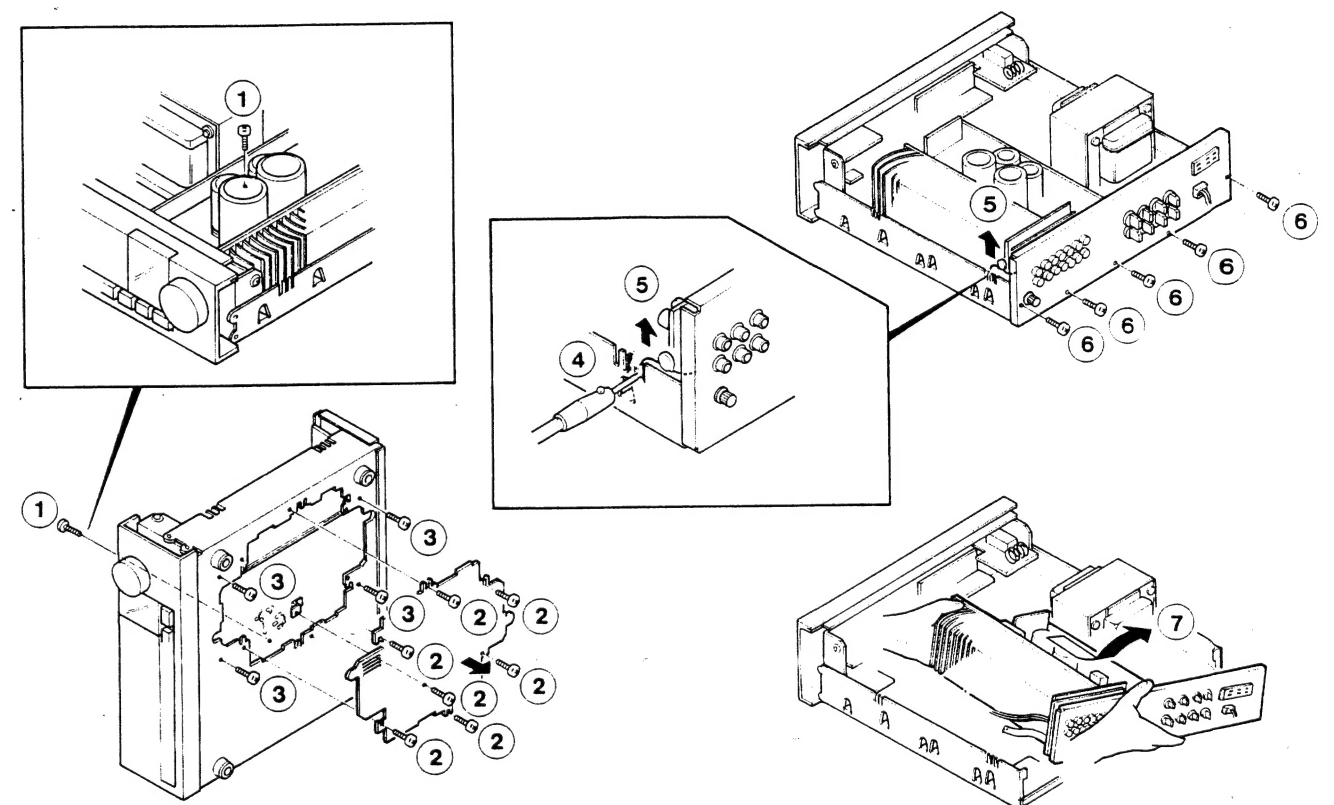


DISASSEMBLY FOR REPAIR

• Removal of Power Amplifier pcb (X07-2150-11)

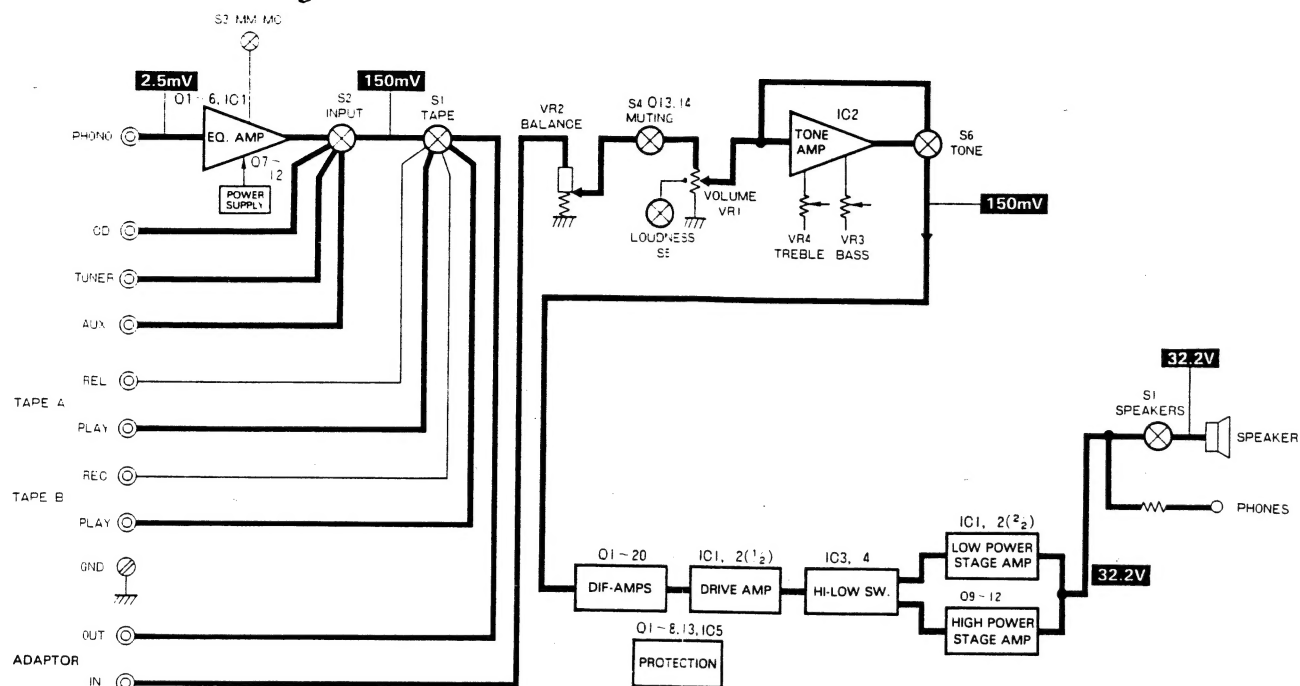
1. Remove the metallic cabinet and a screw near the electrolytic capacitors C13 and C14. (①)
2. Remove the bottom plate and 4 screws retaining the mounting hardware to the chassis from the bottom side. (②, ③)
3. Unsolder the lead of the capacitor between the chassis and the rear panel. (④, ⑤)

4. Remove 5 screws retaining the rear panel to the chassis. (⑥)
5. The power amplifier pcb, with the rear panel and mounting hardware, can be separated from the rest. This allows the components to be replaced easily. (⑦)



BLOCK & LEVEL DIAGRAM/CIRCUIT DESCRIPTION

BLOCK & LEVEL DIAGRAM



CIRCUIT DESCRIPTION

Circuit No.		Application and function	Operation and conditions
X07-2150-11	Q1—8	Current limiter	Final protection when driving with overload.
	Q9—12	Final	Five leads with two chips
	Q13	Protection driver	Turns off relay when the current limiter goes into operation.
	Q14	Lamp driver	
	IC1, 2	Power IC	
	IC3, 4	Switching IC	Comparison/switching of high/low of the DLD
	IC5	Protection IC	Switches off relay when the amp becomes abnormal.
	D1, 2	Rectifying diodes	
X08-2150-00	IC1	Equalizer amp	
	IC2	Tone amp	
	Q1—4	Equalizer input differential amp	
	Q5, 6	Equalizer input differential amp for constant current	
	Q7, 8	Stabilized power supply for the equalizer amp	
	Q9, 10	Constant current for stabilized power supply for equalizer amp	
	Q11, 12	First off for stabilized power supply for equalizer amp	Setting –B to 0 V faster than +B
	Q13, 14	Muting	Mutes for several hundreds msec after power relay is switched ON. Effects muting until power relay turns off after power switch is turned off (to protect power relay).

ADJUSTMENT/REGLAGES/ABGLEICH

ADJUSTMENT

No.	ITEM	INPUT SETTINGS	OUTPUT SETTINGS	AMPLIFIER SETTINGS	ALIGNMENT POINTS	ALIGN FOR	FIG.
1	IDLE CURRENT	—	Connect a DC voltmeter across TP13,14 (L) TP15,16 (R)	VOLUME: 0	VR1 (L) VR2 (R)	20mV	(a)

REGLAGES

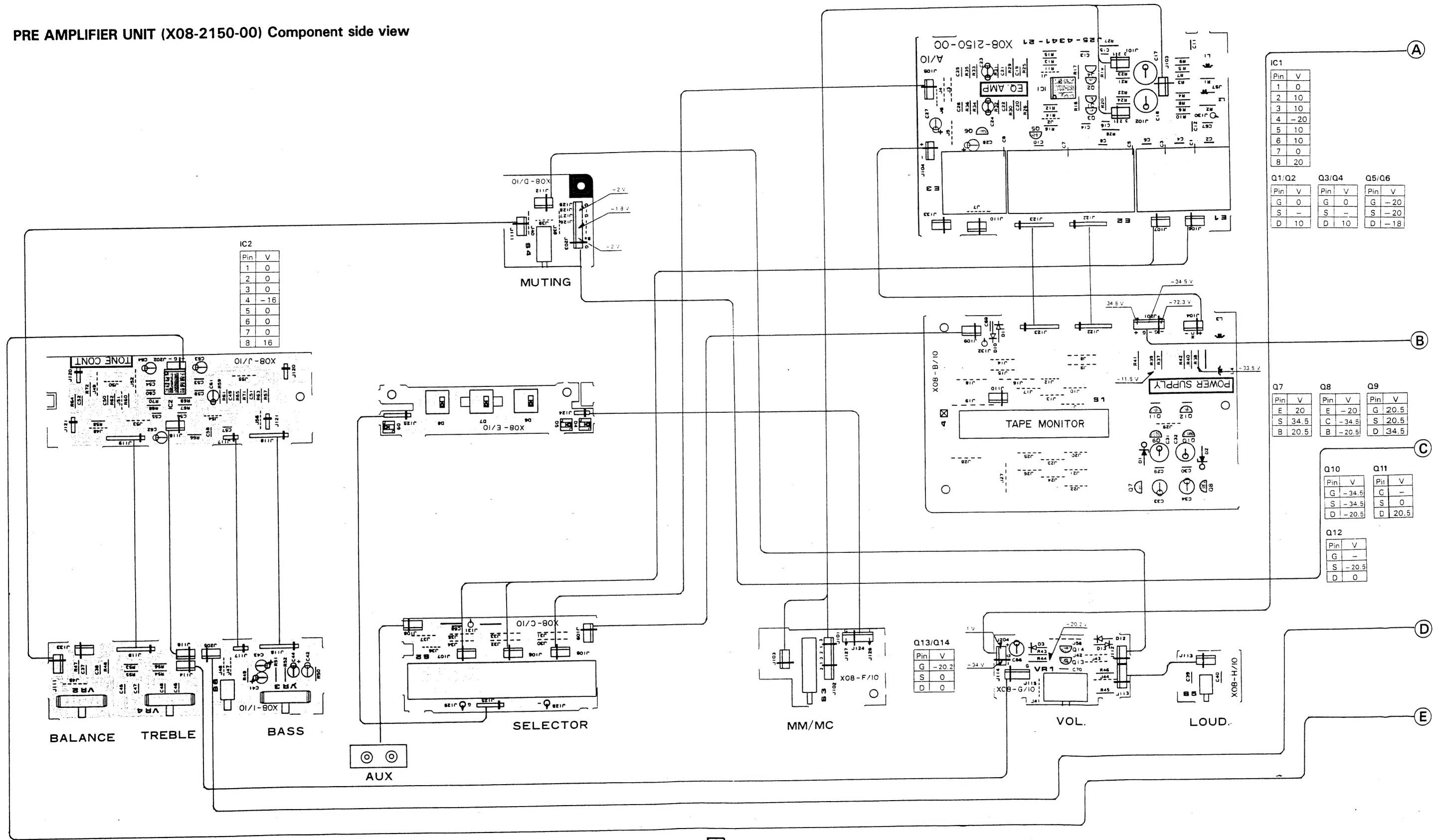
N°	ITEM	REGLAGE DE L'ENTREE	REGLAGE DE LA SORTIE	REGLAGE DE L'AMPLIFICATEUR	POINS L'ALIGNEMENT	ALIGNER POUR	FIG.
1	COURANT DE POLARISATION	—	Connecter un voltmètre de CC sur TP13,14 (G) TP15,16 (D)	VOLUME: 0	VR1 (G) VR2 (D)	20mV	(a)

ABGLEICH

NR.	GEGENSTAND	EINGANGS-EINSTELLUNG	AUSGANGS-EINSTELLUNG	VORSTÄRKER EINSTELLUNG	ABGLEICH-PUNKTE	ABGLEICHEN FÜR	ABZ.
1	LEERLAUFSTROM	—	Einen Gleichspannungsmesser über TP13,14 (L) TP15,16 (R) anschließen	VOLUME: 0	VR1 (L) VR2 (R)	20mV	(a)

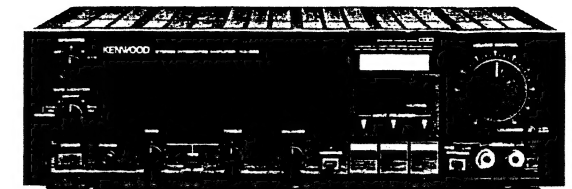
KA-828 KA-828 PC BOARD

PRE AMPLIFIER UNIT (X08-2150-00) Component side view



FRONT

Refer to the schematic diagram for the values of resistors and capacitors. The PC board drawing is viewing from the side easy to check.



Specifications

Power Amplifier Section

Power Output
130 watts* per channel minimum RMS, both channels driven at 8 ohms from 20 Hz to 20,000 Hz with no more than 0.007% total harmonic distortion.

Both Channels Driven into
8 ohms at 1 kHz 0.001% 150 W + 150 W
Total Harmonic Distortion
(20 Hz to 20,000 Hz)
CD, VIDEO/AUX input to
SPEAKER output 0.007% at rated power
into 8 ohms
0.007% at 1/2 rated power
into 8 ohms

Intermodulation Distortion
(60 Hz:7 kHz = 4:1) 0.004% at rated power
into 8 ohms

Frequency Response 8 Hz to 150 kHz -3 dB

Input Sensitivity/Impedance

Phono MM 2.5 mV, 47 k ohms

Phono MC 0.2 mV/100 ohms

Tuner, CD, VIDEO/AUX, Tape 150 mV/47 k ohms

Signal-to-Noise Ratio (IHF, A)

Phono MM 87 dB for 2.5 mV input

Phono MC 69 dB for 250 μ V input

Tuner, CD, VIDEO/AUX, Tape 107 dB

Maximum Input Level for Phono

MM 200 mV (RMS), T.H.D. 0.007%
at 1,000 Hz

MC 17 mV (RMS), T.H.D. 0.007%
at 1,000 Hz

Output Level/Impedance

Tape REC (Pin) 150 mV/330 ohms

Frequency Response for Phono RIAA standard curve ± 0.3 dB
(30 Hz to 20 kHz)

Tone Control

Bass ± 10 dB at 100 Hz

Treble ± 10 dB at 10 kHz

Loudness Control
(at -30 dB VOLUME Level) +6 dB at 100 Hz

General

Power Consumption 6.5 A (U.S.A. and Canada)
250 W (others)

25 W (no signal)

AC Outlets Switched 2, Unswitched 1
(Except European/Australian
countries)

Dimensions W: 340 mm (13-13/32")
H: 109 mm (9-7/32")
D: 369 mm (14-17/32")

Weight (Net) 9.2 kg (20.3 lb)

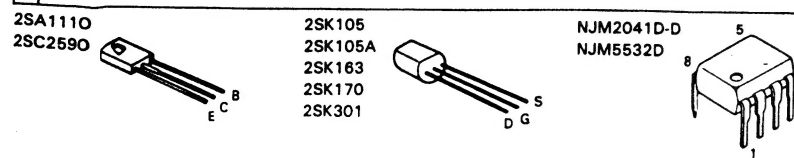
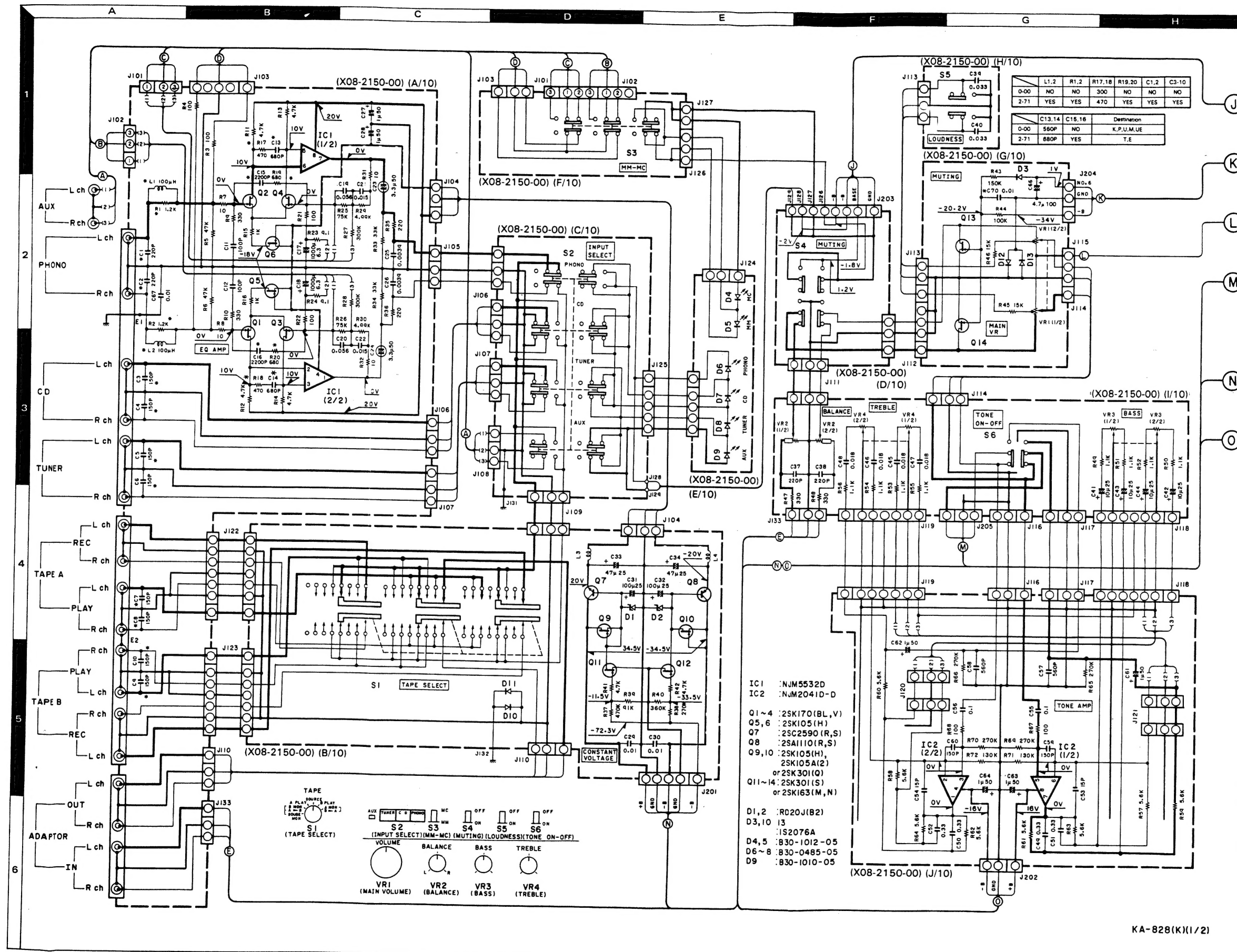
* Measured pursuant to Federal Trade Commission's Trade Regulation rule on Power Output Claims for Amplifier in U.S.A.

Kenwood follows a policy of continuous advancements in development. For this reason specifications may be changed without notice.

Kenwood poursuit une politique de progrès constants en ce qui concerne le développement. Pour cette raison, les spécifications sont sujettes à modifications sans préavis.

Kenwood strebt ständige Verbesserungen in der Entwicklung an. Daher bleiben Änderungen der technischen Daten jederzeit vorbehalten.

DC voltages are as measured with a high impedance voltmeter with no signal input. Values may vary slightly due to variations between individual instruments or/and units.

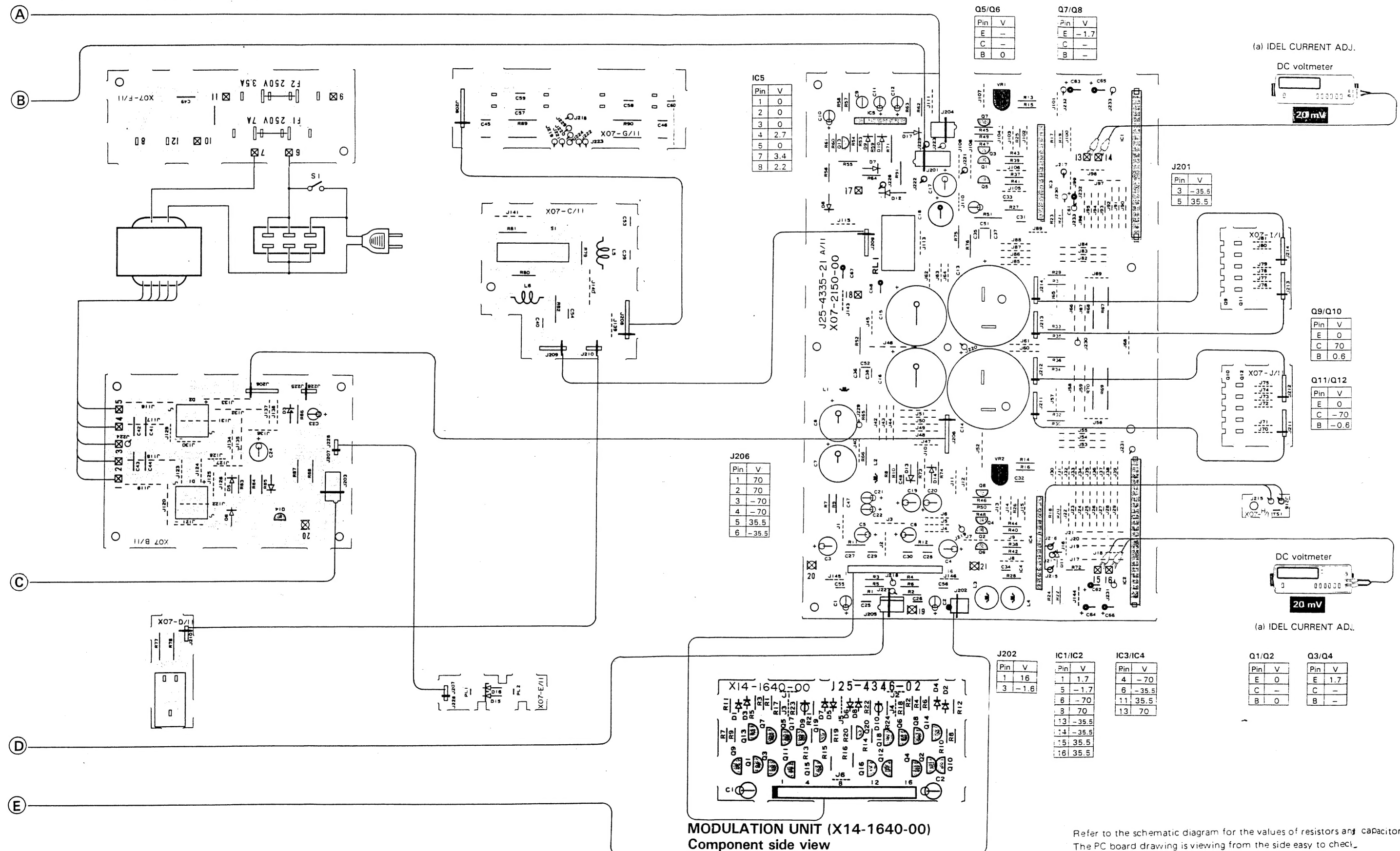


KA-828(K)(1/2)

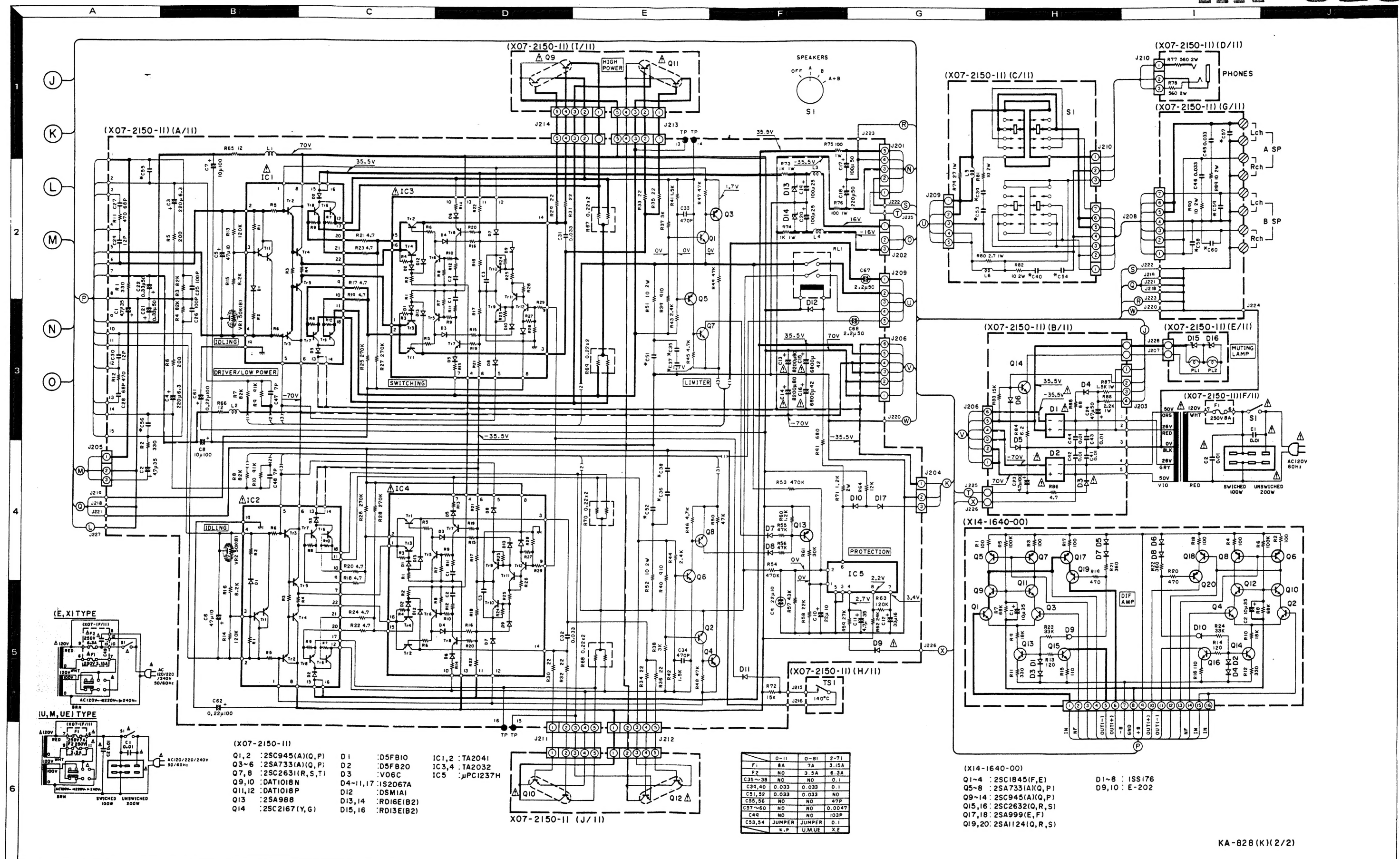
KA-828 KA-828

PC BOARD

MAIN AMPLIFIER UNIT (X07-2150-11) Component side view



Refer to the schematic diagram for the values of resistors and capacitors.
The PC board drawing is viewing from the side easy to check.




2SA1124 2SC2632
2SA733(A) 2SC945(A)
2SA988
2SA999
2SC1845
2SC2631

μPC1237H

TA2041

DAT1018N
DAT1018P

TA2032

CAUTION: For continued safety, replace safety critical components only with manufacturer's recommended parts (refer to parts list).  indicates safety critical components. To reduce the risk of electric shock, leakage-current or resistance measurements shall be carried out (exposed parts are acceptably insulated from the supply circuit) before the appliance is returned to the customer.

KA-828



PARTS LIST

* New Parts

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Teile ohne Parts No. werden nicht geliefert.

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
KA-828						
1	1A	*	A01-0699-12	METALLIC CABINET		
3	2A	*	A20-3984-01	PANEL ASSY		
-			B46-0092-03	WARRANTY CARD	K	
-			B46-0093-03	WARRANTY CARD	P	
-			B46-0094-03	WARRANTY CARD	UUE	
-			B46-0095-03	WARRANTY CARD	UUE	
-			B46-0096-03	WARRANTY CARD	X	
-			B46-0098-03	WARRANTY CARD	E	
-		*	B50-5180-00	INSTRUCTION MANUAL (ENGLISH)	PMXE	
-		*	B50-5181-00	INSTRUCTION MANUAL (FRENCH)	E	
-		*	B50-5182-00	INSTRUCTION MANUAL (G.D.I)	M	
-		*	B50-5183-00	INSTRUCTION MANUAL (SPANISH)		
-			B58-0222-14	CAUTION CARD (PRESET 220V)	UE	
-			B58-0223-04	CAUTION CARD (PRESET 120V)	U	
-			B58-0245-23	CAUTION CARD	E	
-			B58-0269-04	CAUTION CARD	K	
-			B59-0092-00	SERVICE DIRECTORY	UUE	
△ C1	1B		C91-0023-05	CERAMIC 0.01UF AC250V	UMUE	
△ C1	1B		C91-0647-05	CERAMIC 0.01UF P	KP	
△ 10	1C		E03-0061-05	AC OUTLET	KPUM	
△ 10	1C		E03-0061-05	AC OUTLET	UE	
△ 11	2B	*	E13-0225-05	PHONE JACK		
△ 12	1C		E30-0181-05	AC POWER CORD	K	
△ 12	1C		E30-0580-05	AC POWER CORD	E	
△ 12	1C		E30-0685-05	AC POWER CORD	UMUE	
△ 12	1C		E30-0780-05	AC POWER CORD	P	
△ 12	1C		E30-1341-05	AC POWER CORD	X	
13	2B		F19-0295-04	BLIND PLATE		
15	2A		G01-0489-04	COMPRESSION SPRING (MUTING)		
16	2A	*	G01-1452-04	COMPRESSION SPRING (TUNER, CD, PH)		
-		*	H01-5184-04	ITEM CARTON CASE		
-		*	H10-1725-13	POLYSTYRENE FOAMED FIXTURE		
-		*	H10-1731-02	POLYSTYRENE FOAMED FIXTURE		
-		*	H10-1732-02	POLYSTYRENE FOAMED FIXTURE		
-		*	H25-0078-04	PROTECTION BAG (235X315)		
-			H25-0215-04	PROTECTION BAG (COVER)		
19	1C		J12-0094-05	PIN ADAPTOR SHORT PIN		
20	2B, 2C		J02-0129-05	FOOT		
△ 21	1C		J42-0083-05	POWER CORD BUSHING		
-			J61-0307-05	WIRE BAND		
25	2B		K27-0917-04	KNOB (BUTTON) LOUDNESS		
26	2A	*	K27-1176-03	KNOB (BUTTON) PHONE		
27	2A	*	K27-1177-03	KNOB (BUTTON) TUNER		
28	2A	*	K27-1178-03	KNOB (BUTTON) CD		
29	2A	*	K27-1179-03	KNOB (BUTTON) TONE ON/OFF		
30	2B	*	K27-1180-03	KNOB (BUTTON) AUX		
31	2B	*	K27-1181-04	KNOB (BUTTON) CARTRIDGE MM/MC		
32	2A	*	K27-1207-04	KNOB (BUTTON) POWER		
33	2A	*	K27-1248-13	KNOB (BUTTON) MUTING		
34	2A	*	K29-1548-04	KNOB VOLUME		

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△ indicates safety critical components.

PARTS LIST

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Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕 向	Re- marks 備考
35	2A	*	K29-1549-04	KNØB SPEAKERS, TAPE MONITOR		
36	2A	*	K29-1550-04	KNØB BASS, TREBLE, BALANCE		
Δ 40	1B		L01-2481-05	POWER TRANSFORMER	KP	
Δ 40	1B	*	L01-3586-05	POWER TRANSFORMER	UMUEX	
Δ 40	1B	*	L01-3586-05	POWER TRANSFORMER	E	
43	1C		N08-0128-35	BINDING POST GND		
44	2A		N09-0292-05	STEPPED SCREW Ø3X19		
45	1B		N29-0216-05	RIVET LED UNIT		
50	1B	*	S90-0076-05	REMOTE SWITCH SHAFT (TAPE)	P	
Δ S1	1B		S40-1015-05	PUSH SWITCH (POWER)	KUMUE	
Δ S1	1B		S40-1073-05	PUSH SWITCH (POWER)	XE	
Δ S1	1B		S40-1073-05	PUSH SWITCH (POWER)	UMUEX	
Δ S2	2C		S31-2082-05	SLIDE SWITCH (VOLTAGE SEL)	E	
Δ S2	2C		S31-2082-05	SLIDE SWITCH (VOLTAGE SEL)	E	
MAIN AMPLIFIER (X07-2150-11)						
PL1 ,2		*	B30-1025-05	LAMP (14V 0.08A) MUTING		
C1 ,2			CE04FW1V4R7MEL	ELECTRØ 4.7UF 35WV		
C3 ,4		*	CE04FW0J221MEL	ELECTRØ 220UF 6.3WV		
C5 ,6			CE04FW1A470MEL	ELECTRØ 47UF 10WV		
C7 ,8			CE04W2A100MEL	ELECTRØ 10UF 100WV		
C9			CE04HW1A220MEL	NP-ELEC 22UF 10WV		
C10			CE04FW1A220MEL	ELECTRØ 22UF 10WV		
C11			CE04FW1V4R7MEL	ELECTRØ 4.7UF 35WV		
C12			CE04FW1C330MEL	ELECTRØ 33UF 16WV		
Δ C13 ,14			C90-0572-05	ELECTRØ 8200UF 80WV		
Δ C15 ,16			C90-0468-05	ELECTRØ 6800UF 42WV		
C17			CE04FW1H101MEL	ELECTRØ 100UF 50WV		
C18		*	CE04W1H221MEL	ELECTRØ 220UF 50WV		
C19			CE04FW1E101MEL	ELECTRØ 100UF 25WV		
C21 ,22		*	CE04FW2AR33MEL	ELECTRØ 0.33UF 100WV		
C23			CE04FW2A4R7MEL	ELECTRØ 4.7UF 100WV		
C24		*	CE04FW1H470MEL	ELECTRØ 47UF 50WV		
C25 ,26			CC09FS1H101JZS	POLYSTY 100PF J		
C27 ,28			CC45FSL1H680J	CERAMIC 68PF J		
C29 ,30			CC45FSL1H120J	CERAMIC 12PF J		
C31 ,32			CF92FV1H333J	MF 0.033UF J		
C33 ,34			CC45FSL1H471J	CERAMIC 470PF J		
C35 -40			CF92FV1H104J	MF 0.10UF J	XE	
C39 ,40			CF92FV1H333J	MF 0.033UF J	KPUM	
C39 ,40			CF92FV1H333J	MF 0.033UF J	UE	
C41 -44			CK45E2H103P	CERAMIC 0.01UF P		
C45 ,46			CF92FV1H333J	MF 0.033UF J		
C47 ,48			CC45FSL1H070D	CERAMIC 7.0PF D		
Δ C49			C91-0647-05	CERAMIC 0.01UF P	XE	
C51 ,52			CF92FV1H333J	MF 0.033UF J	KPUM	
C51 ,52			CF92FV1H333J	MF 0.033UF J	UE	
C53 ,54			CF92FV1H104J	MF 0.10UF J	XE	
C55 ,56			CC45FSL1H470J	CERAMIC 47PF J	XE	
C57 -60			CK45FB1H472K	CERAMIC 4700PF K	XE	
C61 ,62			CE04FW2AR22MEL	ELECTRØ 0.22UF 100WV	UMUE	
C61 ,62			CE04FW2AR22MEL	ELECTRØ 0.22UF 100WV	XE	
C63 -66		*	CE04FW2AR47MEL	ELECTRØ 0.47UF 100WV	KP	

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C67 ,68			CE04HW1H2R2MEL	NP-ELEC 2.2UF 50WV		
60	2B		E11-0111-05	PHONE JACK (HEADPHONE)		
62	1C	*	E20-0821-05	LOCK TERMINAL BOARD(SPEAKERS)		
△ F1	1C		F05-3121-05	FUSE (SEMKG) 250V T3.15A	XE	
△ F1	1C		F05-7025-05	FUSE 250V 7A	UMUE	
△ F1	1C		F05-8029-05	FUSE (UL) 250V 8A	KP	
△ F2	1B		F05-3523-05	FUSE 250V 3.5A	UMUE	
△ F2	1B		F05-6321-05	FUSE (SEMKG) 250V T6.3A	XE	
65	1C		J13-0041-05	FUSE CLIP	KPUM	
65	1C		J13-0041-05	FUSE CLIP	UE	
65	1C		J13-0054-05	FUSE CLIP	XE	
L1 -4			L33-0275-05	CHOKE COIL		
L5 ,6			L39-0080-15	PHASE-COMPENSATION COIL		
68	1C		N09-1202-05	TAPPING SCREW (Ø3X14)FINAL TR		
69	1C		N09-1236-05	TAPPING SCREW (Ø3X16)IC		
R17 -24		*	RD14AB2E4R7JTS	FL-PROOF RD 4.7 J 1/4W		
R29 -36		*	RD14AB2E220JTS	FL-PROOF RD 22 J 1/4W		
R51 ,52		*	RS14DB3D100J	FL-PROOF RS 10 J 2W		
R65 ,66		*	RD14AB2E120JTS	FL-PROOF RD 12 J 1/4W		
R67 -70			R90-0195-05	METAL-PLATE 0.22 K 5W		
R71			RS14KB3D122J	FL-PROOF RS 1.2K J 2W		
R73 ,74			RS14DB3A102J	FL-PROOF RS 1.0K J 1W		
R75 ,76		*	RS14DB3A101J	FL-PROOF RS 100 J 1W		
R77 ,78		*	RS14KB3D561J	FL-PROOF RS 560 J 2W		
R79 ,80			RS14DB3A2R7J	FL-PROOF RS 2.7 J 1W		
R81 ,82		*	RS14DB3D100J	FL-PROOF RS 10 J 2W	KPUM	
R81 ,82		*	RS14DB3D100J	FL-PROOF RS 10 J 2W	UE	
R81 ,82		*	RS14KB3D100J	FL-PROOF RS 10 J 2W	XE	
R84			RD14AB2E6R2JTS	FL-PROOF RD 6.2 J 1/4W		
R85		*	RD14AB2E680JTS	FL-PROOF RD 68 J 1/4W		
R86			R92-0514-05	FUSE RESIST 4.7 1/4W		
R87		*	RS14DB3A152J	FL-PROOF RS 1.5K J 1W		
R88			RS14DB3A222J	FL-PROOF RS 2.2K J 1W		
R89 ,90		*	RS14DB3D100J	FL-PROOF RS 10 J 2W	KPUM	
R89 ,90		*	RS14DB3D100J	FL-PROOF RS 10 J 2W	UE	
R89 ,90		*	RS14KB3D100J	FL-PROOF RS 10 J 2W	XE	
R91		*	RS14KB3A681J	FL-PROOF RS 680 J 1W		
VR1 ,2			R12-4306-05	TRIMMING POT(50K) IDLE ADJ		
RL1			S51-2045-05	MAGNETIC RELAY		
S1		*	S29-1137-05	ROTARY SLIDE SWITCH(SPEAKERS)		
△ D1		*	D5FB10	DIODE		
△ D2			D5FB20	DIODE		
△ D3			V06C	DIODE		
△ D4 -11			1S2076A	DIODE		
D12			DSM1A1	DIODE		
D13 ,14			RD16E(B2)	ZENER DIODE		
D15 ,16			RD13E(B2)	ZENER DIODE		
D17			1S2076A	DIODE		
△ IC1 ,2		*	TA2041	IC BUFFER,FINAL		
△ IC3 ,4		*	TA2032	IC DRIVER		
ICS			UPC1237H	IC PROTECTION		

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Q1 .2			2SC945(A)(Q,P)	TRANSISTOR		
Q3 .4			2SA733(A)(Q,P)	TRANSISTOR		
Q5 .6			2SA733(A)(Q,P)	TRANSISTOR		
Q7 .8			2SC2631(R,S,T)	TRANSISTOR		
Q9 .10			DAT1018N	TRANSISTOR		
Q11 .12			DAT1018P	TRANSISTOR		
Q13			2SA788	TRANSISTOR		
Q14			2SC2167(Y,G)	TRANSISTOR		
PRE AMPLIFIER (X08-2150-00)						
D4 .5			B30-1012-05	LED(SLP-981C-50) MM,MC		
D6 -8			B30-0485-05	LED(SLF-202B-01) INPUT		
D9			B30-1010-05	LED(SLP-281F-50U)AUX		
C1 .2			CC45FSL1H221J	CERAMIC 220PF J	XE	
C3 -10			CC45FSL1H151J	CERAMIC 150PF J	XE	
C11 .12			C91-0088-05	POLYSTY 100PF K		KPUM
C13 .14			CK45FB1H561K	CERAMIC 560PF K		UE
C13 .14			CK45FB1H561K	CERAMIC 560PF K		
C13 .14			CK45FB1H681K	CERAMIC 680PF K	XE	
C15 .16			CK45FB1H222K	CERAMIC 2200PF K	XE	
C17 .18		*	C90-1281-05	ELECTRO 1000UF 6.3WV		
C19 .20			CF92FV1H563J	MF 0.056UF J		
C21 .22			CF92FV1H153J	MF 0.015UF J		
C23 .24		*	C90-1283-05	ELECTRO 3.3UF 50WV		
C25 .26			CF92FV1H392J	MF 3900PF J		
C27 .28			CE04FW1H010MEL	ELECTRO 1.0UF 50WV		
C29 .30			CF92FV1H103J	MF 0.010UF J		
C31 .32		*	C90-1282-05	ELECTRO 100UF 25WV		
C33 .34			CE04FW1E470MEL	ELECTRO 47UF 25WV		
C37 .38			CC45FSL1H221J	CERAMIC 220PF J		
C39 .40			CF92FV1H333J	MF 0.033UF J		
C41			CE04FW1E100MEL	ELECTRO 10UF 25WV		
C42			CE04FW1E100MEL	ELECTRO 10UF 25WV		
C43 .44			CE04FW1E100MEL	ELECTRO 10UF 25WV		
C45 -48			CF92FV1H183J	MF 0.018UF J		
C49 -52			CF92FV1H334J	MF 0.33UF J		
C53 .54			CC45FSL1H150J	CERAMIC 15PF J		
C55 .56			CF92FV1H104J	MF 0.10UF J		
C57 .58			CK45FB1H561K	CERAMIC 560PF K	XE	
C59 .60			CC45FSL1H151J	CERAMIC 150PF J		
C61			CE04FW1H010MEL	ELECTRO 1.0UF 50WV		
C62 -64			CE04FW1H010MEL	ELECTRO 1.0UF 50WV		
C66			CE04FW2A4R7MEL	ELECTRO 4.7UF 100WV		
C67			CK45FF1H103Z	CERAMIC 0.01UF Z		
C70			CK45FF1H103Z	CERAMIC 0.01UF Z		
E1		*	E13-0624-05	PHONE JACK(6P) PHONE,CD,TUNER		
E2			E13-0818-05	PHONE JACK(8P) TAPE A/B		
E3			E13-0496-05	PHONE JACK(4P) ADAPTOR		
L1 .2			L40-1011-43	SMALL FIXED INDUCTOR(100UH,K)	XE	
L3 .4			L33-0275-05	CHOKE COIL		
R25 .26			RN14DK2E753J	RN 75K J ~ 1/4W		
R27 .28			RN14DK2E304J	RN 300K J 1/4W		
R29 .30			RN14DK2E4991G	RN 4.99K G 1/4W		
VR1	2B		R06-5099-05	POTENTIOMETER(100KX2)VOLUME		

E: Scandinavia & Europe H: Audio Club K: USA

P: Canada

S: South Africa

T: England

U: PX(Far East, Hawaii)

UE: AAFES(Europe)

X: Australia

M: Other Areas

⚠ indicates safety critical components

PARTS LIST

* New Parts

Parts without Parts No. are not supplied.

Les articles non mentionnés dans le Parts No. ne sont pas fournis

Teile ohne Parts No. werden nicht geliefert.

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
VR2	1B	*	RD6-5125-05	POTENTIOMETER(200KX2) BALANCE		
VR3 ,4	1B	*	RD6-3042-05	POTENTIOMETER(10KX2) BASS, TREB		
S1	1C		S90-0070-05	SLIDE SWITCH TAPE MONITOR		
S2	2B	*	S42-4038-05	PUSH SWITCH(4KEY) INPUT SELECT		
S3	2B	*	S40-6025-05	PUSH SWITCH CARTRIDGE MM/MC		
S4	2B		S40-4045-05	PUSH SWITCH MUTING		
S5 ,6	1B, 2B		S40-2122-05	PUSH SW LOUDNESS, TONE ON/OFF		
D1 ,2			RD20J(B2)	ZENER DIODE		
D3			1S2076A	DIODE		
D10 -13			1S2076A	DIODE		
IC1		*	NJM5532D	IC OP AMP		
IC2			NJM2041D-D	IC OP AMP		
Q1 -4			2SK170(BL, V)	FET		
Q5 ,6			2SK105(H)	FET		
Q7			2SC259D(R, S)	TRANSISTOR		
Q8			2SA1110(R, S)	TRANSISTOR		
Q9 ,10			2SK105(H)	FET		
Q9 ,10			2SK105A(2)	FET		
Q9 ,10			2SK301(Q)	FET		
Q11 -14			2SK163(M, N)	FET		
Q11 -14			2SK301(S)	FET		
MODULATION (X14-1640-00)						
C1 ,2		*	CE04FW1V100MEL	ELECTRO 10UF 35WV		
D1 -8			1SS176	DIODE		
D9 ,10		*	E-202	CONSTANT CURRENT DIODE		
Q1 -4			2SC1845(F, E)	TRANSISTOR		
Q5 -8			2SA733(A)(Q, P)	TRANSISTOR		
Q9 -14			2SC945(A)(Q, P)	TRANSISTOR		
Q15 ,16			2SC2632(Q, R, S)	TRANSISTOR		
Q17 ,18			2SA999(E, F)	TRANSISTOR		
Q19 ,20			2SA1124(Q, R, S)	TRANSISTOR		

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Note:

Component and circuitry are subject to modification to insure best operation under differing local conditions. This manual is based on, the U.S. (K) standard, and provides information on regional circuit modification through use of alternate schematic diagrams, and information on regional component variations through use of parts list.

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